tor unit discharge patterns, which have not been described previously.

PS-32-6 Decomposition of compound muscle action potentials (CMAP) from abductor pollicis brevis muscle (APB) with feed-forward neural network

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A feed-forward neural network was implemented to decompose the surface CMAP based on spatial and temporal summations of the templates of motor unit potentials. The motor unit templates for slow and fast types of motor units were collected by the low level voluntary contraction of the muscle, and near threshold stimulation of median nerve at the wrist, respectively. The surface CMAPs from normal APB muscle corresponding to 100%, 50%, and 10% of the maximal stimulus intensities were obtained by electrical stimulation of median nerve at the wrist. The estimate of the number of motor units in the muscle was 157. Our study also showed that at 50% of maximal stimulus intensity, 30.9% of slow motor units had been recruited compared to 52.5% of fast motor units. Whereas, at 10% of maximal stimulus intensity, only 1% of slow motor units had been recruited compared to 24.2% of fast motor units. We believe that this technique is simple and non-invasive, and can be applied to electrophysiological examination of patients with neuromuscular disorders to obtain more information with regard to: 1) the number of motor units recruited; 2) the type of motor units and their distribution in the motor neuron pool; and 3) the way different types of motor units are recruited.

PS-32-7 Physiological properties of single thenar motor unit F-waves generated and detected by surface electrodes

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While trying to activate single thenar motor units by median nerve percutaneous stimulation (0.05 ms duration and near threshold intensity) at the wrist, F-waves may be recorded after the M-response. We have studied some properties of these surface-recorded unitary F-waves in 23 control subjects (age range from 21 to 91 y.o.): incidence, persistence, central latency, chronodispersion and latency fluctuation of one single unit. F-waves identical in shape, size and latency on two or more occasions are assumed to reflect activity of a single motor unit. With 10 distinct single motor unit F-waves, chronodispersion and the shortest central latency were studied in each subject. The latency fluctuation of six high persistence motor unit F-waves was automatically calculated with built-in software of the Nicolet Viking I EMG machine. In our series, F-waves were regularly evoked even if only one motor unit was recruited by near threshold stimulation. Incidence of such late responses was about 10% of the activated motor units. The range of unitary F persistence was from 1 to 45%. The mean shortest central latency was 25.5 ± 1.9 ms and was significantly correlated with age and height of the subjects. The mean chronodispersion was 3.7 ± 1.8 ms and was not correlated with age and height. The mean latency fluctuation of one single unit was 42 ± 15.7 μs. This study confirms that supramaximal stimulations are not necessary to evoke F-responses, it gives some parameters to evaluate conduction velocity of a single motor unit and provides a tool to study excitability of single motoneuron in man.

PS-32-8 An estimation procedure to determine motor unit structure from surface EMG data

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The shape of motor unit action potentials (MUAPs) as measured at the skin surface largely depends on the position of the motor unit relative to the recording electrode. For example, the amplitude of trigger-averaged MUAPs decreases rapidly with increasing motor unit-recording distance. Apart from the depth, the two other coordinates of the fiber ends and the motor end plate region also have their influence on the recorded MUAP shape. This knowledge has been used in a non-linear inverse parameter estimation procedure. Muscle fibers of finite length within an infinite, anisotropic volume conductor are considered. The procedure estimates the relevant coordinates of the muscle fibers within a motor unit, as well as the mean of the muscle fiber conduction velocity and the motor unit size, from surface EMG data. Therefore, this method is capable of giving a description of the motor unit's position and structure from the surface EMG. Not only motor units with muscle fibers parallel to the skin surface or electrode array can be described, but also those with a more complex orientation with respect to the skin.

PS-32-9 Standardization of "burst EMG" analysis (see WS-7-5)

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"Burst EMG" is a summated electrical response recorded from muscles during an abrupt movement. The electrical response is generated by a volley of motor unit action potentials that fire rapidly, overlapping and interfering with one another.

In cases where voluntary cooperation is poor, abrupt movement could be elicited by external proprioceptive stimulation and an EMG burst would then be the only electrical activity available for analysis. In this study, a method is described in which a burst of EMG is divided into its basic segment components. Each segment is characterized by its duration, amplitude and area. Average segment area is calculated by digitally integrating the segments in a burst of EMG, provided that the burst duration is > 300 msec and the potential amplitude is > 100 μV. A normal range is determined for the distribution of segment area.

Segment area was calculated for a group of patients with myopathy and neurogenic disorders which were previously diagnosed elsewhere on the basis of history, clinical findings, enzyme studies, muscle biopsy etc. It was found that values of segment area can support a clinical diagnosis by distinguishing normal subjects from patients with neuromuscular disorders.

PS-32-10 Estimation of motor unit location and size from surface electromyography

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Because of its global character, surface EMG (SEMG) is hardly used in the field of clinical neurophysiology. When multiple leads are applied, SEMG can provide more detailed information. Because of the volume conductor properties of tissue, the amplitude